MAP C-116

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

GEOLOGIC MAP AND COAL STRATIGRAPHIC FRAMEWORK OF THE CEDAREDGE AREA, DELTA COUNTY, COLORADO

By C. Richard Dunrud

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COAL INVESTIGATIONS MAP
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DUNRUD—GEOLOGY AND COAL, CEDAREDGE AREA, COLORADO 1:50,000 MAP C-116

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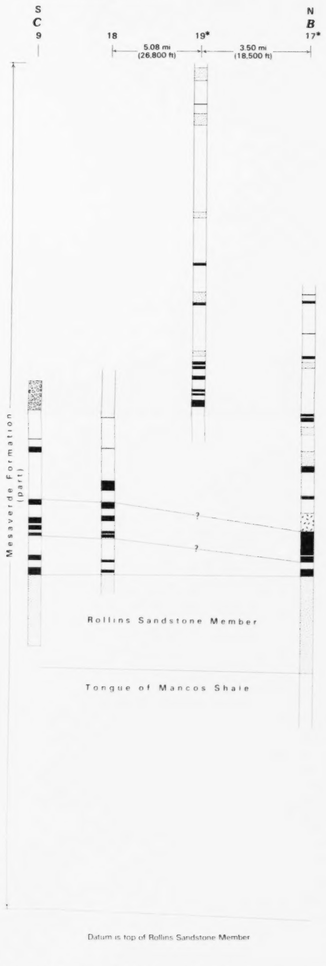


Section *C–B*—West Fork of Currant Creek to upper Surface Creek

Section *D–E*—Stull Ditch to upper Leroux Creek

Base from U.S. Geological Survey,
Delta County, sheets 1, 2, and 3, 1975

EXPLANATION OF COAL SECTIONS

(Open top and (or) bottom of section indicates partial section. Asterisk (*) indicates that sections were made from geophysical logs. Distance between drill holes are to map scale unless otherwise indicated)

VERTICAL SCALE
1 INCH = 100 FEET

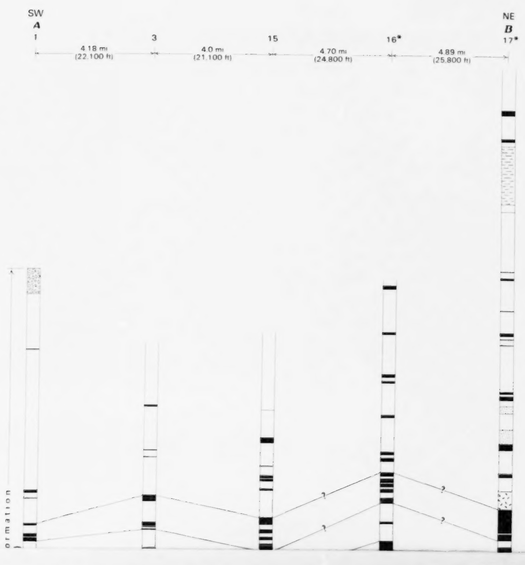
- Surficial deposits (Quaternary)
- Sandstone
- Sandstone interbedded with shale
- Shale, mudstone, and (or) siltstone
- Shaly sandstone
- Coal bed
- Thin coal beds, bony coal, and carbonaceous shale
- Mafic sill
- Slickensided zones

Table 1.—*Drill-hole data*

(Asterisk (*) indicates that only geophysical logs were used to determine lithology and coal beds; all others are lithologic logs of drill holes. Leaders (--) indicate information not available. T.D. indicates total depth of drill hole.)

Map no.	Drill hole name	Drill-hole location: Twp.	Rge.	Sec.	1/4 1/4 Sec.	Drill-hole elev. (ft): Ground	Top of Rollins	T.D. (ft)
	Section *A–F*—Rollins mine to Oak Mesa							
1	*HK 77-1	13S.	96W.	34	SE. NW.	8,030	7,447	597
2	HK 77-3	13S.	96W.	24	NE. SW.	7,660	6,964	702
3	Fairlamb 75-2	13S.	95W.	18	NW. SE.	7,670	6,675	1,103
4	HK 77-5	13S.	95W.	16	SW. NW.	6,780	6,415	405
5	CE 77-2	13S.	95W.	11	SW. SW.	6,700	6,249	460
6	CE 80-4A	13S.	95W.	12	SE. NW.	---	6,155	---
7	BM 7	13S.	94W.	8	SW. SE.	6,731	6,152	---
8	CE 77-3	13S.	94W.	15	NE. NE.	7,170	6,885	380
9	WS-2	13S.	94W.	12	SE. NW.	7,020	6,722	311
10	DC 77-1	13S.	93W.	7	SW. NW.	7,040	6,765	295
11	DC 77-3	13S.	93W.	8	NE. NW.	6,960	6,665	308
12	†DC 77-4	13S.	93W.	16	NE. NE.	7,480	6,943	603
13	GR 77-1	13S.	92W.	24	NW. SW.	8,310	7,282	1,038
14	GR 77-3	13S.	92W.	19	SE. SW.	8,230	7,309	933
	Section *A–B*—Rollins mine to Park Reservoir on Grand Mesa							
1	HK 77-1	13S.	96W.	34	SE. NW.	8,030	7,447	597
3	Fairlamb 75-2	13S.	95W.	18	NW. SE.	7,670	6,675	1,103
15	CE 77-1	12S.	95W.	2	SW. SW.	8,800	5,956	858
16*	TXP, Scott 19-1	12S.	94W.	19	NW. NE.	8,418	4,970	4,240
17*	2 Mickelson Gov't	11S.	94W.	34	NE. NW.	10,122	3,897	7,250
	Section *C–B*—West Fork of Currant Creek to upper Surface Creek							
9	WS-2	13S.	94W.	12	SE. NW.	7,020	6,722	311
18	DC 77-2	13S.	94W.	1	SW. NE.	7,400	6,453	963
19*	2 Leon Lakes	12S.	94W.	14	NW. NE.	8,892	---	4,111
17*	2 Mickelson Gov't	11S.	94W.	34	NE. NW.	10,122	3,897	7,250
	Section *D–E*—Stull Ditch to upper Leroux Creek							
12	DC 77-4	13S.	93W.	16	NE. NE.	7,480	6,943	603
20	DC 77-5	13S.	93W.	10	C. SE 1/4.	7,680	6,841	862
21*	1 Gov't C	12S.	92W.	9	SW. SW.	9,815	4,795	6,100

†Includes Rollins mine section (Rollins Sandstone Member and below) of Gill and Hail (1975) and Lee (1912) located in the NW 1/4 sec. 25.
‡Includes the Stull Ditch section (Rollins Sandstone Member and below) of Gill and Hail (1975) and Lee (1912) located in the NE 1/4 sec. 22.



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COAL INVESTIGATIONS
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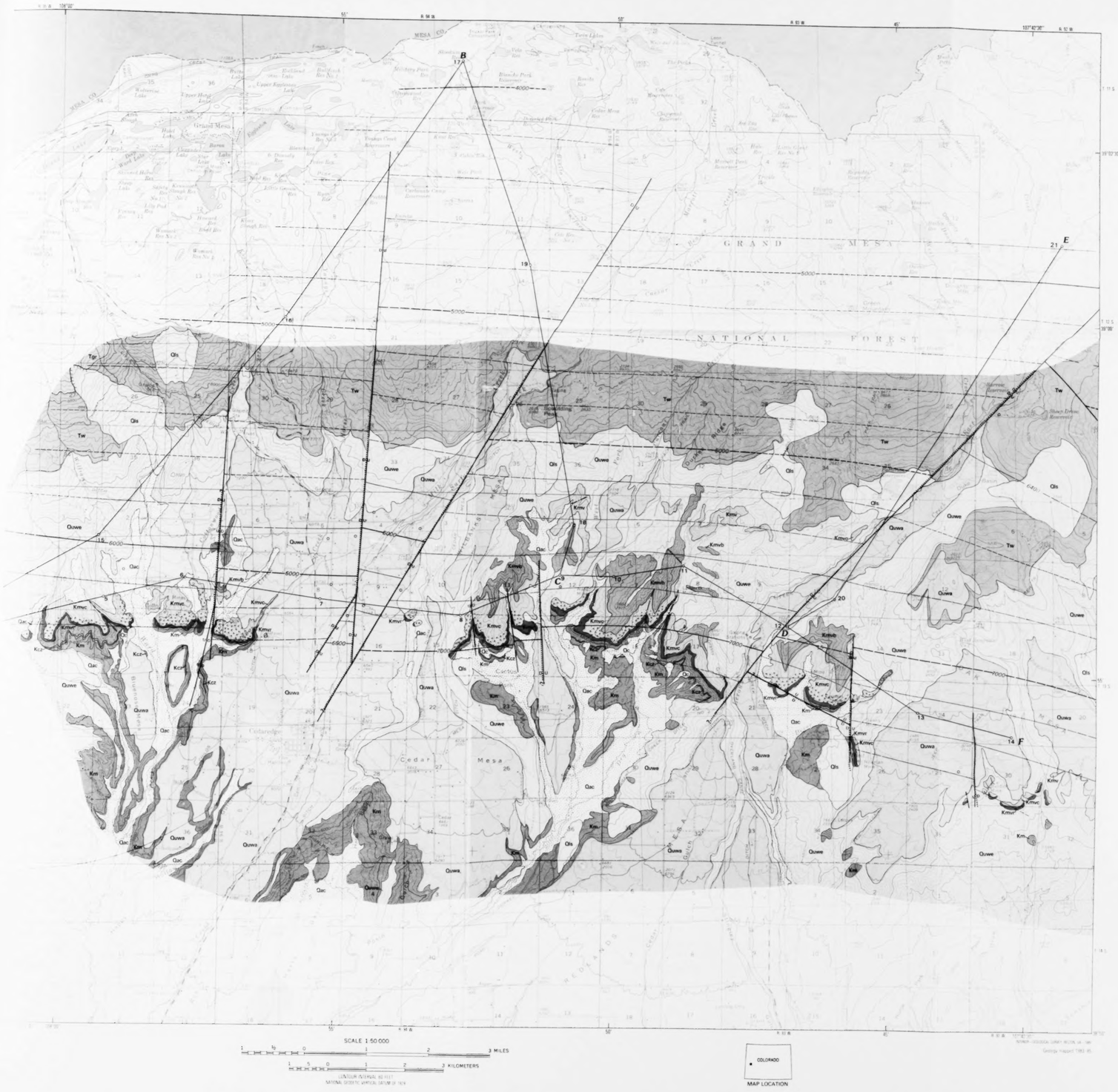
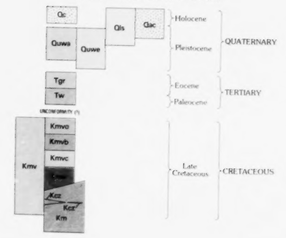


CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS (QUATERNARY)

Qc **Colluvium (Holocene)**—Clay, silt, sand, gravel, and boulders. Larger components are angular to subangular. Deposited by sheet wash or by slow, downslope movement. May locally include unmapped landslides, alluvial deposits, and bedrock.

Qls **Landslides and mudflows (Holocene and Pleistocene)**—Clay, silt, sand, gravel, and boulders; heterogeneous to poorly sorted. Cracks and scarps are locally common in upper part; hummocky topography and local closed depressions are common near base of deposits. Formed by various combinations of slumping, sliding, and flowing. Bedrock is locally exposed in upper part of slide area. **Terrain within a mapped landslide may range from new scarps, cracks, flows, and ledges, to subdued, hummocky topography,** which is locally covered by mudflows and alluvium that range in age from the last few decades to prehistoric times. Queried where uncertain.

Qac **Alluvium and colluvium, undifferentiated (Holocene and Pleistocene)**—May locally include unmapped alluvium, terrace deposits, and bedrock.

Quwa **Alluvial deposits (Pleistocene)**—Formed in unit Quwe. Surfaces of deposit dip toward modern drainages, such as the North Fork Gunnison River. May include local unmapped pediments.

Quwe **Unconsolidated deposits (Pleistocene)**—Clay, silt, and sand, primarily derived from the Wasatch Formation; gravel and boulders are primarily derived from extrusive rocks (basalts) capping Grand Mesa. Heterogeneous to moderately well sorted; unstratified to well stratified. Locally forms hummocky topography, closed depressions, and various flow features resembling landslide and mudflow deposits. Proportion of different size fractions, degree of sorting, and stratification is variable and commonly controls permeability, response of material to erosion, and mass-gravity movements. Material commonly is stable and resistant on steep slopes and locally water bearing where composed of stratified sand, gravel, and boulders. May be unstable, erodes easily on steep slopes, contains little or no water where heterogeneous, unstratified, and where clay is the dominant component. May include local areas of unmapped bedrock and alluvial and colluvial deposits. As much as 200 ft (60 m) ft.

SEDIMENTARY ROCKS

Tgr **Green River Formation (Eocene)**—Light-gray shale, siltstone, marlstone, and sandstone; local oil shale beds.

Tw **Wasatch Formation (Eocene and Paleocene)**—Varicolored (mostly various shades of brown, gray, and red) claystone and mudstone with local lenticular beds of sandstone and limestone; commonly contains a basal conglomerate. Lenticular sandstones near base contain volcanic components. Large landslides and mudflows are common in claystone on steep slopes; locally may contain small, unmapped landslides, alluvium, colluvium, and other unconsolidated deposits. Local coal beds were mapped near base by Godwin (1968, this apparently is the same interval called "Unnamed rocks" by Yeend, 1969, p. 8). Approximately 1000 ft exposed in map area.

Kmv **Mesaverde Formation, undifferentiated (Upper Cretaceous)**—Above the Rollins Sandstone, consists of sandstone, shale, mudstone, and coal beds. Commonly forms moderately steep slopes where underlain by mudstone and shale and cliffs or ledges where underlain by sandstones. May locally include small, unmapped surficial deposits. Total thickness about 2800 ft (850 m).

Kmvo **Ohio Creek Member**—Also called Ohio Creek Formation in the Marcellina Mountain area to the east by Gaskill and Godwin (1966). Stratigraphic rank assignment is that of Johnson and May (1980). Sandstone, fine to coarse grained, locally conglomeratic, particularly in upper part; light gray to tan; lenticular, interbedded with mudstone and shale that are light gray to medium gray. Thickness about 900 ft (270 m).

Kmvb **Barren member**—Sandstone, mudstone, and shale; light brown to light gray. Sandstone is commonly fine to very fine grained; beds are lenticular and commonly range from a few feet to about 100 ft (30 m) thick. Thin, non-commercial coal beds are locally present. Thickness about 1000 ft (300 m).

Kmvc **Coal-bearing member**—Sandstone fine to very fine grained, light yellowish brown, interbedded with mudstone, shale, or siltstone light gray to dark gray. Contains coal beds and coal zones as much as 30 ft (9 m) thick. Includes the Bowie Shale Member and Paonia Shale Member of Lee (1912); Hanks (1962); and Collins (1970, 1976) and the lower and upper coal members of V. H. Johnson (unpub. mapping, 1948) in the eastern part of map but only the Paonia Shale Member of Lee (1912) in the Rollins mine area. Thickness ranges from about 700 ft (210 m), near Park Reservoir on Grand Mesa, to about 350 ft (105 m) near the Rollins mine.

Kmr **Rollins Sandstone Member**—Sandstone fine to very fine grained, tan to very light gray. Becomes coarser grained and more quartzose in upper part. Siliceous and calcareous cement common but locally is unCemented. Gradational contact with underlying tongue of Mancos Shale. Elongate iron concretions (Ophiomorpha) are locally common in upper part. Using the top of the Cozzette Member as a datum, the top of the unit is about 190 feet (58 m) stratigraphically higher at the eastern boundary of the map than it is near the Rollins mine at the western edge of the map. Thickness about 80–200 ft (24–54 m).

Kcz **Cozzette Member of Gill and Hail (1975)**—Sandstone and siltstone, light tan to pale yellowish orange to gray. Sandstone becomes finer grained downward in section and also becomes generally finer grained eastward. Separated from the overlying Rollins Sandstone Member by a tongue of Mancos Shale. Thickness ranges from a few feet in eastern part of map to about 35 ft (10.5 m) near the western boundary of the map. The top of the Cozzette Member was used as a datum for the coal sections where possible, as was done by Gill and Hail (1975). Unit is mapped as a single line in the eastern part of the map.

Km **Mancos Shale (Upper Cretaceous)**—Shale and mudstone, light gray to medium gray, with local, thin, impure limestone beds. Locally contains small deposits of unmapped alluvium and colluvium. Thickness about 4000–4500 ft (1200–1,375 m).

Burned coal beds—Rocks commonly are stained reddish brown and altered, baked, and locally fused.

Contact—Approximately located, inferred, or locally hidden by surficial deposits.

Fault—Dashed where approximately located, short dashed where inferred, dotted where concealed, queried where uncertain of location and extent. U, upthrown side; D, downthrown side.

Subsurface fault—Shown where it intersects top of Rollins Sandstone Member. D, downthrown side; U, upthrown side.

Active landslide scarp that exposes bedrock.

Subsidence area—Downwarped area caused by past coal mining; cracks are common near boundaries; mapped rom aerial photographs by stereographic methods.

Lineament—Visible on aerial photographs. Coincides with or parallel to valleys or ridges.

Structure contours—Drawn on top of the Rollins Sandstone Member. Dashed where approximately located, short dashed where inferred. Datum is mean sea level, contour interval 200 ft (60 m).

Drill hole—Numbered drill holes are referred to in table 1 and are shown in the coal sections.

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ACKNOWLEDGMENTS

Lithologic and coal logs were provided by Grand Mesa Coal Co. The logs greatly aided analysis and correlation of coal beds. The Company's cooperation is gratefully acknowledged.

Coal stratigraphic information was obtained from G. P. Eager (unpub. mapping, 1978, 1979); Lee (1912); G. H. Horn and J. Alliger (unpub. mapping, 1947); and G. H. Horn and A. Ritchhart (unpub. mapping, 1949).

Geology in the Cedaredge area was modified in part from Hail (1972).

SELECTED REFERENCES

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Section *C–B*—West Fork of Currant Creek to upper Surface Creek

EXPLANATION OF COAL SECTIONS

(Open top and (or) bottom of section indicates partial section. Asterisk (*) indicates that sections were made from geophysical logs. Distance between drill holes are to map scale unless otherwise indicated)

- Surficial deposits (Quaternary)
- Sandstone
- Sandstone interbedded with shale
- Shale, mudstone, and (or) siltstone
- Shaly sandstone
- Coal bed
- Thin coal bed, bony coal, and carbonaceous shale
- Mafic sill
- Slickensided zones

VERTICAL SCALE METERS FEET 60 600 50 500 40 400 30 300 20 200 10 100 0 0

Tongue of Mancos Shale (Part)

Datum is top of Cozzette Member

Section *D–E*—Stull Ditch to upper Leroux Creek

Table 1.—*Drill-hole data*

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Map no.	Drill hole Name	Drill-hole location Twp.	Rge.	Sec.	1/4 1/4 Sec.	Drill-hole elev. (ft) Ground	Top of Rollins	T.D. (ft)
	Section *A–F*—Rollins mine to Oak Mesa							
1	[1]HK-77-1	13S.	96W.	34	SE, NW	8,030	7,447	597
2	HK-77-3	13S.	96W.	24	NE, SW	7,860	6,984	702
3	Fairlamb 75-2	13S.	95W.	18	NW, SE	7,670	6,675	1,103
4	HK-77-5	13S.	95W.	16	SW, NW	8,760	8,415	405
5	CE-77-2	13S.	95W.	11	SW, SW	8,700	8,249	460
6	CE-80-4A	13S.	95W.	12	SE, NW	---	8,155	---
7	BM-7	13S.	94W.	8	SW, SE	8,731	8,152	---
8	CE-77-3	13S.	94W.	15	NE, NE	7,170	6,885	360
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20	DC-77-5	13S.	93W.	10	C, SE 1/4	7,680	6,841	982
21*	1-Gov't C	12S.	92W.	8	SW, SW	9,815	4,795	6,100

[1]Includes Rollins mine section (Rollins Sandstone Member and bakeout of Gill and Hail (1975) and Lee (1912) located in the NW 1/4 sec. 35.

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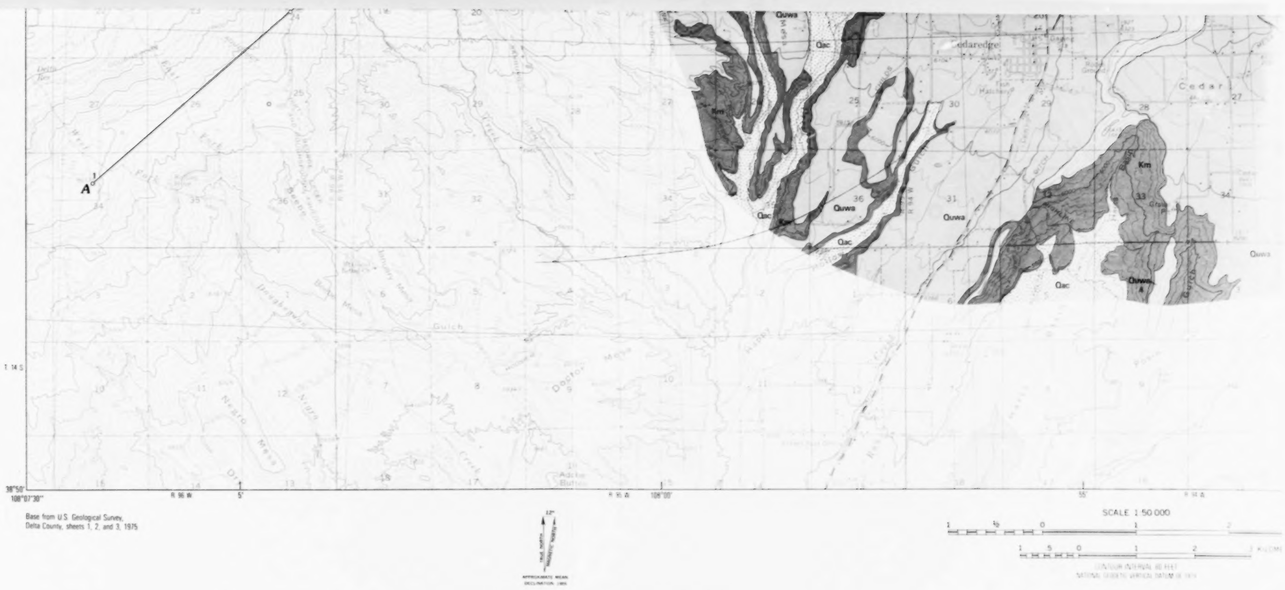

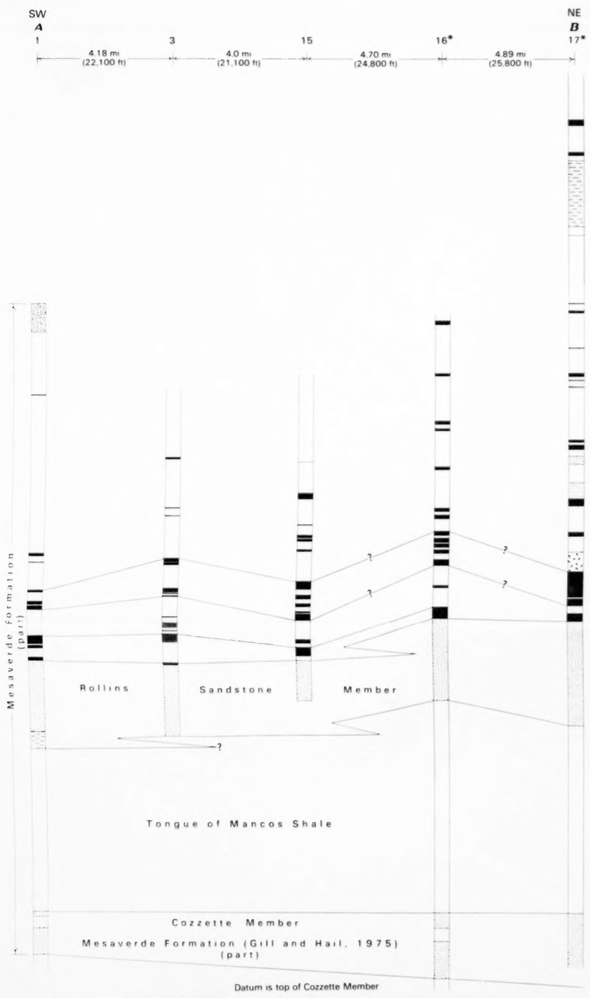

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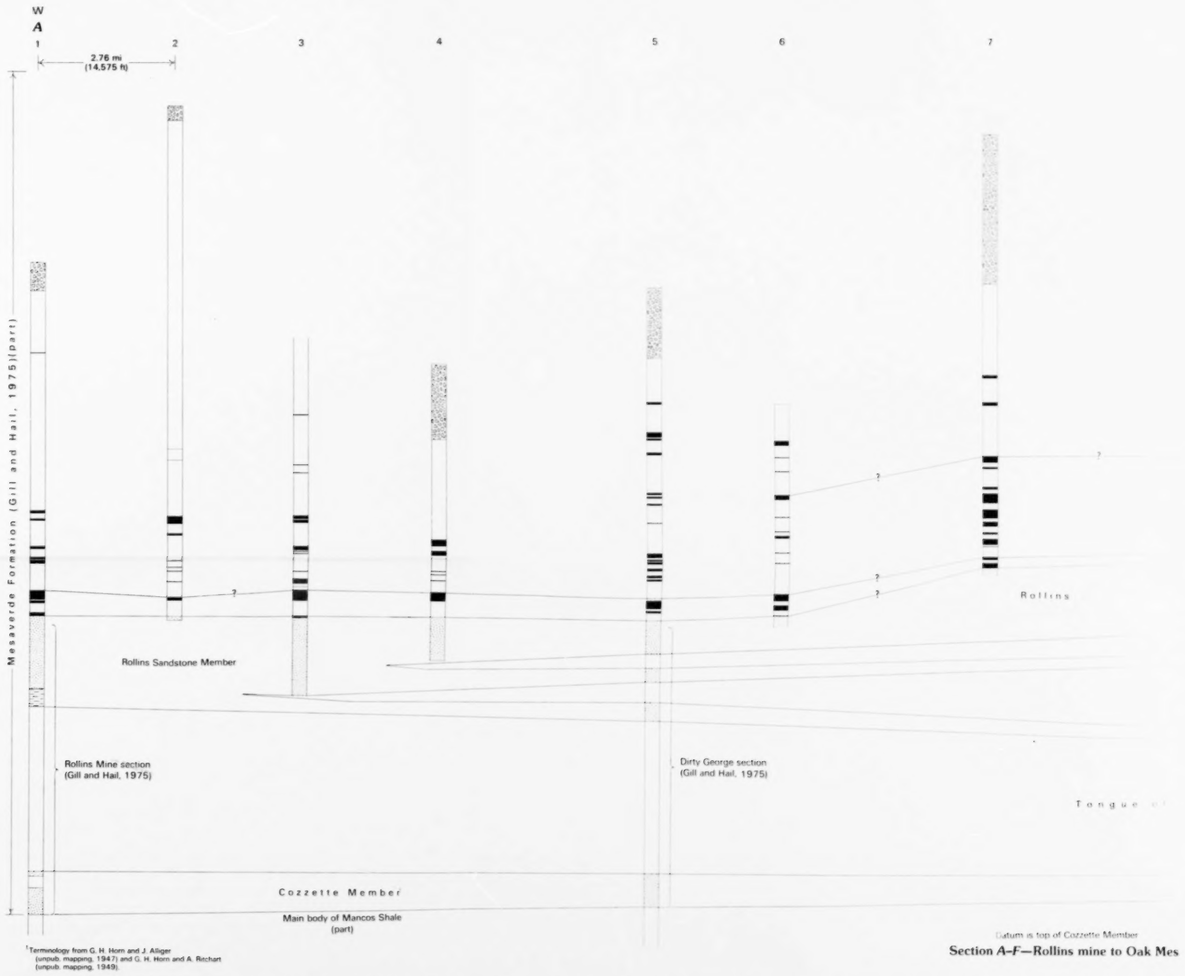

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Section *A–F*—Rollins mine to Oak Mes

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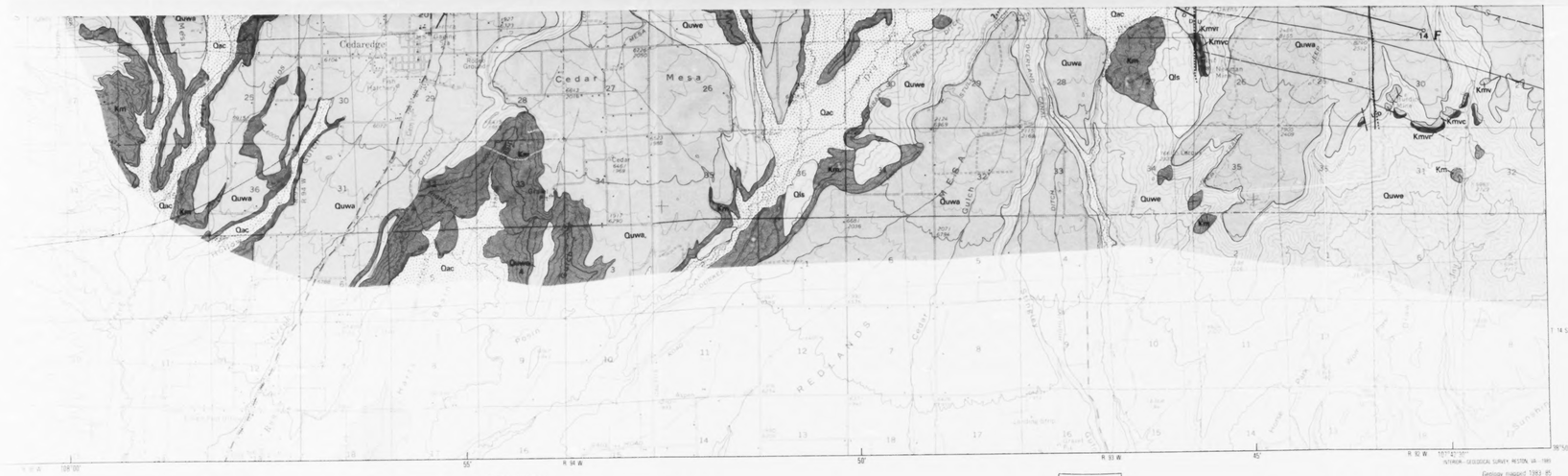

Thickness about 900 ft (270 m)

Kmvb **Barren member**—Sandstone, mudstone, and shale; light brown to light gray. Sandstone is commonly fine to very fine grained; beds are lenticular and commonly range from a few feet to about 100 ft (30 m) thick. Thin, noncommercial coal beds are locally present. Thickness about 1000 ft (330 m)

Kmvc **Coal-bearing member**—Sandstone, fine to very fine grained, light yellowish brown, interbedded with mudstone, shale, or siltstone, light gray to dark gray. Contains coal beds and coal zones as much as 30 ft (9 m) thick. Includes the Bowie Shale Member and Paonia Shale Member of Lee (1912), Hanks (1962), and Collins (1970, 1976) and the lower and upper coal members of V. H. Johnson (unpub. mapping, 1948) in the eastern part of map but only the Paonia Shale Member of Lee (1912) in the Rollins mine area. Thickness ranges from about 700 ft (210 m), near Park Reservoir on Grand Mesa, to about 350 ft (105 m) near the Rollins mine

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Burned coal beds—Rocks commonly are stained reddish brown and altered, baked, and locally fused

Contact—Approximately located, inferred, or locally hidden by surficial deposits

Fault—Dashed where approximately located, short dashed where inferred, dotted where concealed, queried where uncertain of location and extent. U, upthrown side; D, downthrown side

Subsurface fault—Shown where it intersects top of Rollins Sandstone Member. D, downthrown side; U, upthrown side

Active landslide scarp that exposes bedrock

Subsidence area—Downwarped area caused by past coal mining; cracks are common near boundaries; mapped rom aerial photographs by stereographic methods

Lineament—Visible on aerial photographs. Coincides with or parallel to valleys or ridges

Structure contours—Drawn on top of the Rollins Sandstone Member. Dashed where approximately located, short dashed where inferred. Datum is mean sea level; contour interval 200 ft (60 m)

Drill hole—Numbered drill holes are referred to in table 1 and are shown in the coal sections

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Gaskill, D. L. and Godwin, L. H., 1966, Geologic map of the Marcellina Mountain quadrangle, Gunnison County, Colorado: U.S. Geological Survey Geologic Quadrangle Map GQ-511, scale 1:24,000.

Gill, J. R. and Hail, W. J., Jr., 1975, Stratigraphic sections across Upper Cretaceous Mancos Shale—Mesaverde Group boundary, eastern Utah and western Colorado: U.S. Geological Survey Oil and Gas Investigations Chart OC-68.

Godwin, L. H., 1968, Geologic map of the Chair Mountain quadrangle, Gunnison and Pitkin Counties, Colorado: U.S. Geological Survey Geologic Quadrangle Map GQ-794, scale 1:24,000.

Hail, W. J., Jr., 1972, Reconnaissance geologic map of the Cedaredge area, Delta County, Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-697, scale 1:48,000.

Hanks, T. L., 1962, Geology and coal deposits, Ragged-Chair Mountain area, Pitkin and Gunnison Counties, Colorado: Brigham Young University Geologic Studies, v. 9, pt. 2, p. 137–160.

Johnson, R. C. and May, Fred, 1980, A study of the Cretaceous-Tertiary unconformity in the Piceance Creek Basin, Colorado; The underlying Ohio Creek Formation (Upper Cretaceous) redefined as a member of the Hunter Canyon or Mesaverde Formation: U.S. Geological Survey Bulletin 1482-B, 27 p.

Lee, W. T., 1912, Coal fields of Grand Mesa and the West Elk Mountains, Colorado: U.S. Geological Survey Bulletin 510, 237 p.

Yeend, W. E., 1969, Quaternary geology of the Grand and Battlement Mesas area, Colorado: U.S. Geological Survey Professional Paper 617, 50 p.

LITHOFACIES RELATIONSHIPS OF MEMBERS OF MESAVERDE FORMATION AND MANCOS SHALE IN THE CEDAREDGE AREA

Section *A–F*—Rollins mine to Oak Mesa

STRATIGRAPHIC FRAMEWORK OF THE CEDAREDGE AREA, DELTA COUNTY, COLORADO

By

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1989

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